can digest materials such as gelatin and hemoglobin. In this paper, we reported the isolation and molecular detection of *A. hydrophila* from *Clarius batrachus.*

AH PO 13

Development of selenium enriched probiotic to enhance shrimp health

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In today's shrimp farming practices, the probiotics, the live microbial adjuncts have become integral farm inputs to enhance productivity. Selenium is an essential dietary nutrient that plays an important role in the functioning of the immune system and promoting cellular immune response. In addition, selenium in the bioavailable form has been shown to promote growth and may improve health of the shrimp because of its anti-microbial property. To harness the beneficial effects of selenium, in the present study, selenium nanoparticles (SeNPs) were synthesised in probiotic bacteria and examined for their potential to enhance shrimp immunity and larval survival. *Bacillus subtilis,* a probiotic strain isolated from brackishwater environment possessing antagonistic activity against shrimp pathogenic vibrios was used for synthesizing biogenic SeNPs. Sodium selenite at three concentrations (0.5, 1.0 and 2.0 mM Se) was incorporated in tryptone soy broth. The selenium incorporated bacteria change medium to reddish colour as indication of development of SeNPs. Scanning electron microscopic images confirmed formation of SeNPs on the bacterial surface. Three concentrations of SeNPs, mentioned above, with final probiotic bacterial counts of 10^3 and 10^6 cfu mL^{-1} were administered to shrimp larvae by immersion method. With 0.5mM Se incorporation using 10^3 cfu mL^{-1} probiotic bacteria, the shrimp post-larval (PL) survival was found to be significantly higher (95%) than in controls (60%). The larval group with only *B. subtilis* exhibited 65% survival while other concentrations of SeNPs with *B. subtilis* ranged from 75-90% survival. The treatment enhanced expression of anti-microbial genes studied viz., lysozyme, crustin, prophenoloxidase and penaeidin. It is evident that SeNPs incorporated probiotic bacteria improves the immunity of the shrimp and larval survival. While the dual beneficial effects have been confirmed in this small scale study, actual hatchery trials could reveal the utility of this approach. Further, the potential of combination SeNPs and probiotic in minimising losses to vannamei hatcheries due to luminescent bacterial disease and zoea syndrome could also be explored.

AH PO 14

Effect of piperine on haematological and biochemical parameters of *Argulus* infested goldfish *Carassius auratus* (Linn. 1758)

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Argulus are common crustacean ectoparasites of fish and severely damage the fish tissues. In the present study, we evaluated the affect of concentration of piperine solutions on haemato-serum biochemical parameters of *Argulus* infested *Carassius auratus*. Seven experimental groups were made, each having 15 numbers of *Argulus* infested *C.*

auratus except one positive control ($T0^+$) where healthy goldfish was maintained. Five treatment groups *viz.,* T1, T2, T3, T4 and T5 treated with 1, 3, 5, 7 and 9 mg L^{-1} piperine solution through bath, respectively and negative control ($T0^-$) with only 2% DMSO. *In vivo* antiparasitic efficacy of piperine was estimated after 3 days of consecutive bath treatment. A complete elimination of *Argulus* was observed in groups that were treated with 7 and 9 mg L^{-1} piperine. After 7 days of post-treatment, the blood and serum from each group was evaluated for haematological and serum biochemical parameters. A significant ($p<0.05$) elevated total leucocyte count (TLC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), glucose, total protein (TP), serum glutamate oxaloacetate transaminase (SGOT) and serum glutamate pyruvate transaminase (SGPT) in *Argulus* infested *C. auratus* was found when compared to healthy fish. The results reveal *Argulus* infestation have a noticeable impact on haematological and serum biochemical parameters. The significant ($p<0.05$) reduction in haematological and serum biochemical parameters were recorded in all the treatment groups in comparison with negative control group. The T4 and T5 groups showed significantly ($p<0.05$) high superoxide dismutase (SOD), catalase, total erythrocyte count (TEC) and haemoglobin (Hb). However, higher blood glucose and lactate dehydrogenase (LDH) levels in 9 mg L^{-1} piperine treated group revealed that higher concentration of piperine have prominent effects on tissues metabolism and physiology of the host. In conclusion 7 mg.L^{-1} piperine solution through bath treatment can be used to control *Argulus* spp.

AH PO 15

Studies on haemolytic response of crustacean haemolymph against pathogenic bacteria on blood agar

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Nonspecific immune responses play very important role in crustacean immune system defending from external pathogens. Haemocytes particularly involve in vital physiological functions such as repair of wounds, transportation of food materials, coagulation of haemolymph, phagocytosis, nodule formation, encapsulation of bacteria and activation of prophenol oxidase system. It is essential to determine the role of haemocytes when pathogenic bacteria get encountered to an animal. Haemolysis of blood cells can serve as an evidence for the better understanding of crustacean immune responses. In this study, haemolymph collected aseptically form *Litopenaeus vannamei* and *Scylla serrata* was used for preparing blood agar plates to study haemolytic activity against aquatic and human pathogens. Haemolymph (5%) was supplemented to the basal medium for preparing blood agar plates with the addition of rose bengal dye (0.06%). The following type cultures are used for the study viz., *Edwardsiella tarda* (ATCC 15947), *Aeromonas hydrophila* (ATCC 35654), *Enterobacter cloacae* (ATCC 13047), *Pseudomonas aeruginosa* (ATCC 10145), *Escherichia coli* (ATCC 35218), *Staphylococcus aureus* (ATCC 43300), *Vibrio cholerae* (MTCC 3906) and *Salmonella paratyphii* (ATCC 15305). The overnight grown cultures was harvested, the optical density (600 nm) adjusted to 0.5